(19)日本国特許庁（ＪＰ）　(12)**公開特許公報**（Ａ）　(11)特許出願公開番号

特開平10－115637

(43)公開日　平成10年(1998)５月６日

(51)Int.Cl.[6]	識別記号	ＦＩ	
Ｇ０１Ｒ　1/073		Ｇ０１Ｒ　1/073	Ｄ
31/26		31/26	Ｊ
Ｈ０１Ｌ　21/66		Ｈ０１Ｌ　21/66	Ｂ
Ｈ０５Ｋ　1/09		Ｈ０５Ｋ　1/09	Ｃ
1/11		1/11	Ｃ

審査請求　有　　請求項の数４　ＯＬ　（全８頁）

(21)出願番号　特願平8－270984

(22)出願日　平成８年(1996)10月14日

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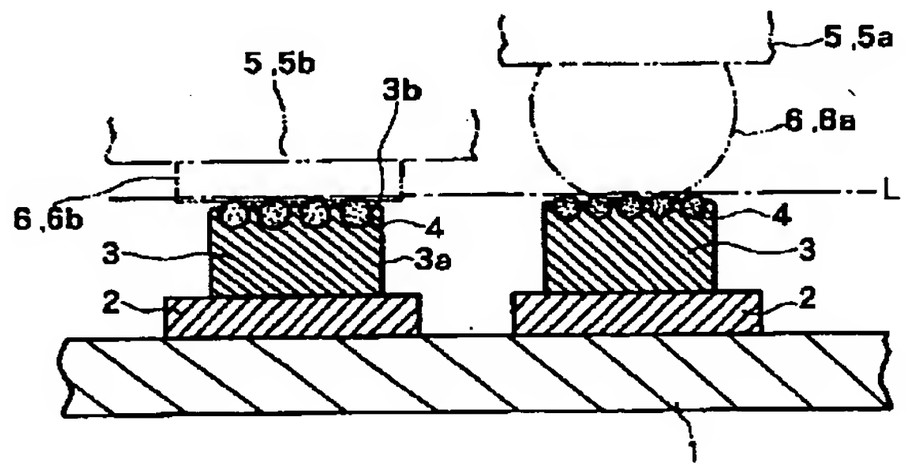
(54)【発明の名称】　電子部品接触用フレキシブル配線板

(57)【要約】
【課題】本発明は検査用配線基板のバンプと検査対象であるベアＩＣやＢＧＡ形ＩＣパッケージの外部接点との接触を健全にし、且つこれら外部接点の微小ピッチ化に有効に対処する。
【解決手段】合成樹脂製フレキシブル絶縁フィルム１の表面に配線パターンを施し、該配線パターンを形成する導電リード２，２′の表面に軟質金属から成る導電バンプ３を設け、該導電バンプ３の頂部表面に限定して硬質金属から成る複数の導電粒子４を圧入によって植設する電子部品接触用フレキシブル配線板。



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【特許請求の範囲】
【請求項１】合成樹脂製フレキシブル絶縁フィルムの表面に配線パターンを施し、該配線パターンを形成する導電リードの表面に軟質金属から成る導電バンプを設け、該導電バンプの頂部表面に限定して硬質金属から成る複数の導電粒子を圧入によって植設したことを特徴とする電子部品接触用フレキシブル配線板。
【請求項２】合成樹脂製フレキシブル絶縁フィルムの表面に配線パターンを施し、該絶縁フィルム及び配線パターンの表面を絶縁カバーコートで一体に覆い、上記配線パターンを形成する導電リードの表面に軟質金属から成る導電バンプを設け、該導電バンプを絶縁カバーコートに設けた小孔を通し同カバーコート表面より突出させ、該導電バンプの突出部頂面に限定して硬質金属から成る多数の導電粒子を圧入により植設したことを特徴とする電子部品接触用配線板。
【請求項３】上記各導電バンプが合成樹脂製フレキシブル絶縁フィルムの表面と略平行な突出レベルを以って植設されていることを特徴とする請求項１又は２記載の電子部品接触用フレキシブル配線板。
【請求項４】上記配線パターンが合成樹脂製フレキシブル絶縁フィルムの表面に並列配置した導電リードから成り、該導電リードの先端部表面に導電バンプが形成されていることを特徴とする請求項１又は２記載の電子部品接触用フレキシブル配線板。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】この発明はＢＧＡ（ボールグリッドアレー）形ＩＣパッケージや、ベアＩＣ、ＭＣＭ基板（マルチチップモジュール基板）等の電子部品の検査時等に使用する電子部品接触用フレキシブル配線板に関する。
【０００２】
【従来の技術】最近の電子機器の小形軽量化、高性能化の急速な進捗に伴ない、これに用いられるＩＣの高集積化、微小化傾向が更に進み、外部接点の微細化、高密度をもたらしている。
【０００３】これらＩＣによっては従来のようなコンタクトプローブの先端を外部接点に押し当てる方式のソケットでは上記狭ピッチ化に対応することが困難で、適正な接触が得難くなって来ている。
【０００４】
【発明が解決しようとする課題】そこで、出願人は合成樹脂製フレキシブル絶縁フィルムの表面に配線パターンをメッキ成長させ、この配線パターンを形成するリードの表面に導電バンプをメッキ成長させ、これを弾性ゴムシート等でバックアップしつつＢＧＡ形ＩＣパッケージやベアＩＣの外部接点（導電ボールや導電箔）に押し当てる方法を試行した。
【０００５】この方法はメッキ又はエッチングによりリードを微小ピッチで配線することができ、又フィルムのフレキシブル性により高さにバラツキのある外部接点やバンプに対し追随的に接触できる利点を有し、ＩＣの外部接点の微小ピッチ化に対応できる点で改善をもたらした。

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【０００６】然しながら、反面ＩＣの外部接点（前記導電ボールや導電箔）と導電バンプの微小面積の接触点において酸化被膜を突き破り高信頼の接触性を確保するには導電バンプの突端を円錐形に尖らす等して接触圧を高めねばならないが、前記の通り導電バンプの高さのバラツキが避け難いことに加え、微小なバンプをメッキ或いは半田ペーストの印刷等の手法により尖鋭形に賦形することは極めて困難である。それ故にこの問題点を解決し電機的接触の安定性と信頼性を保証することが課題となり、この解決によって微小ピッチ化に対処できる利点を生かすことができる。
【０００７】
【課題を解決するための手段】本発明は上記技術的要請に応える電子部品接触用フレキシブル配線板を提供するものである。
【０００８】本発明は配線パターンを施した配線板を接触手段とし、配線基板として合成樹脂製フレキシブル絶縁フィルムを用いフレキシブル性を接触に関与させるようにした構成と、上記配線パターンを形成するリード表面に設けた軟質金属から成る導電バンプで集中点接触を図るようにした構成と、この導電バンプの頂部表面に限定して硬質金属から成る複数の導電粒子を圧入によって植設し上記バンプによる接触を補完するようにした構成とが相補して電子部品の微小ピッチで微細な外部接点に対する安定で高信頼の接触が確保でき、究極の課題であるリードの微小ピッチ化に有効に対処できる。
【０００９】上記配線板の基板となる合成樹脂製フレキシブル絶縁フィルムはそのフレキシブル性によってＩＣの外部接点と導電バンプの高さのバラツキを有効に吸収する。又このフィルム表面にメッキ又はエッチング等により配線した配線パターン（リード）によってＩＣ外部接点の微小ピッチ化に有効に対処する。
【００１０】又上記リードの表面に設けた導電バンプの頂部表面に植設した導電粒子によってフィルムのフレキシブル性を伴ないつつ、確実にＩＣの外部接点に喰い込む。
【００１１】この導電粒子はこれより軟質の金属から成る導電バンプに圧入によって植設し、微小な導電バンプに対する導電粒子の露出植設を極めて容易にする。
【００１２】又この圧入植設手段の採用により複数の導電粒子の突出レベルを略均一に植設する構造にし、導電粒子の突出レベルを均一にして各導電粒子をＩＣの外部接点に対し均一に加圧接触させる。
【００１３】又上記合成樹脂製フレキシブル絶縁フィルム及び配線パターンを覆う絶縁カバーコートを設け、こ

のカバーコートの小孔を通して上記導電バンプを突出させ、この突出部頂面に限定して上記導電粒子を圧入によって植設する。

【００１４】上記カバーコートの存在によって小孔より突出する導電バンプの頂部表面積を拡大でき、この拡大面に充分な量の導電粒子を植設し、導電バンプを拡大してもバンプ間の短絡を有効に防止する。

【００１５】液晶板の検査に使用するプローブユニットにおいては、合成樹脂製フレキシブル絶縁フィルムの表面に並列リード群をメッキ成長させ、この並列リード群の先端部表面に前記導電バンプを設け、この導電バンプの頂部表面に限定して導電粒子を圧入により定レベルに植設する。

【００１６】これにより液晶板の端縁に並設された微小ピッチの電極（外部接点）に対し、高信頼の接触を確保する。

【００１７】

【発明の実施の形態】以下、本発明に係る電子部品接触用フレキシブル配線板の実施形態例を、図１乃至図７に基き詳述する。

【００１８】上記配線板は合成樹脂製フレキシブル絶縁フィルム１をベースとしている。

【００１９】図１乃至図４に示すように、この合成樹脂製絶縁フィルム１の表面にメッキ又はエッチングによる配線パターンを形成する。即ち配線パターンを形成する導電リード２をメッキにより成長せしめるか、導電層にエッチングを施して所要のパターンを形成する。メッキによりリード２を成長させる方法は一例として合成樹脂製フレキシブル絶縁フィルム１の表面に導電層と感光レジスト層を形成し、この感光レジスト層の表面に配線パターンに応じたマスクをかぶせて露光し、この露光部を除去することにより配線パターンに応じたレジストパターンを形成し、このレジストパターン間に露出せる導電層部分の表面に導電リードをメッキ成長させて配線パターンを形成し、感光レジストパターンを除去した後、エッチングによりこの配線パターン間の導電層部分を除去して配線パターンを形成するリード間を互いに隔絶する。又は導電層に単にエッチングを施して所要の配線パターンを形成する。

【００２０】上記配線パターンを形成する導電リード２の表面に軟質金属から成る導電バンプ３を電子部品５の外部接点６に対応して付設する。図１、図２に示す導電バンプ３は周囲側面３ａを垂直面で且つ平面視円形に付形し、頂面３ｂを略平面にしている。この平面が曲率の大なる弧形面にする場合を包含する。

【００２１】上記導電バンプ３は一例として図３に示す方法によって形成する。先ず図３Ａに示すように、合成樹脂製フレキシブル絶縁フィルム１及びリード２を覆う感光レジスト層１６を形成し、この感光レジスト層１６に導電バンプの配置に対応した円形の小孔を有するマスクを被せてこの小孔内の感光レジスト層部を露光し、この露光部を除去して図３Ｂ，Ｂ′に示す如く、感光レジスト層１６にリード表面において開口する平面視円形の小孔１７を形成し、図３Ｃに示す如くこの小孔１７内においてリード表面に導電バンプ３をメッキ成長させ、次に図３Ｄに示すように、レジスト層１６を除去する。この導電バンプ３は側面３ａが垂直で且つ平面視円形であり、頂面３ｂが略平面である。

【００２２】そして上記導電バンプ３の頂部表面３ｂに限定して硬質金属から成るギザギザの表面を有する複数の導電粒子４を圧入によって植設し、該バンプ３の頂部表面３ｂから突出する導電粒子部分をＩＣ等の電子部品５の外部接点６との加圧接触に供する。

【００２３】上記電子部品５はベアＩＣを内蔵せるＩＣ本体の下面に微小ピッチで高密度に配置された導電ボール６ａ（外部接点６）を有するＢＧＡ形ＩＣパッケージであり、又はベアＩＣ本体５ｂの下面に微小ピッチで高密度に配置された導電箔６ｂ（外部接点６）を有するＩＣチップである。又本発明はＩＣパッケージ本体の下面に多数の外部接点たる導電箔６ｂを配したリードレス形ＩＣパッケージに実施可能である。

【００２４】上記合成樹脂製フレキシブル絶縁フィルム１は、適例としてポリイミド樹脂フィルム又は液晶ポリマーフィルムを用いる。この両フィルムは耐熱性とリードのメッキ性が良好であり、熱による伸縮が少なく適性である。更に液晶ポリマーフィルムは吸湿性がなく、吸湿による寸法変化を防止でき、又誘電率が低く配線基板としての特性に優れ、更に熱伝導性が良好で冷却効果に優れている。

【００２５】又上記導電バンプ３を形成する軟質金属としては、ニッケルに錫メッキか半田メッキか金メッキしたもの、又は金、又は半田、又は導電ペースト等が適当である。

【００２６】又上記導電粒子４を形成する硬質金属としてはダイヤモンド、又はコバルト、又はニッケル、又は超鋼が用いられる。

【００２７】次に図４に示す例は、ベース板たる合成樹脂製フレキシブル絶縁フィルム１の表面に配線パターンをメッキ成長させ、該絶縁フィルム１及び配線パターンの表面を絶縁カバーコート１２で一体に覆っている。

【００２８】そして上記配線パターンを形成する導電リード２の表面に軟質金属から成る導電バンプ３を設け、該導電バンプ３を上記絶縁カバーコート１２に設けた小孔１３を通し同カバーコート表面より突出させ、該導電バンプの突出部頂面に限定して硬質金属から成る多数の導電粒子４を圧入により植設した構造である。

【００２９】上記絶縁カバーコートは合成樹脂フィルムから成り、このフィルムの所定位置にＩＣの外部接点に対応した多数の小孔１３を開設したものを用意し、この孔穿きフィルムを上記ベース板たる合成樹脂製フレキシ

ブル絶縁フィルム１の表面に重ね付け、例えば母材融着し、配線パターンを形成するリード２を覆うと共に、各小孔１３内底においてリード表面を露出させ、この小孔１３内において導電バンプ３をメッキ成長させ、小孔１３の開口面（カバーコート１２表面）から突出させる。

【００３０】この時、カバーコート１２の表面から突出する導電バンプ３の該突出部（頂部）は小孔１３より大径にし、突出部外周縁部を小孔１３の開口縁部表面に密着せしめる。換言すると、導電バンプ３は小孔１３内を満たし小孔内面に密着しつつリード表面に強固に結合する小径の基部１４と、小孔１３の開口面から傘形に隆起する基部１４より大径の頂部１５を有する。

【００３１】この頂部１５は絶縁カバーコート１２の存在によって拡径が可能であり、この拡径によって頂部表面積を増加し、この頂部表面に所要量の導電粒子４を圧入するのである。

【００３２】上記絶縁カバーコート１２の存在は導電粒子４がリード間に脱落して短絡する不具合を解消し、又仮にカバーコート１２上に脱落しても直ちにはバンプ間短絡にも至らず、カバーコート表面から容易に落下させる等して除去できる。

【００３３】又図４に示すようにカバーコート１２の存在により、導電粒子４の圧入時に、同粒子４がリード間や、バンプ３の側面に付着するのを有効に防止する。

【００３４】次に図５は上記導電バンプ３をメタルコート導電ボールで形成した場合を例示している。このメタルコート導電ボールはプラスチックボールやセラミックボール等の絶縁ボール９の周面に前記例示した軟質金属から成る導電金属膜１０をコーティングした構造を有し、このメタルコート導電ボールを導電ペースト１１を介して導電リード２の表面に強固に接着し、該ボール頂面の導電金属膜１０に導電粒子４を圧入によって植設する。この時導電粒子４は導電金属膜１０を突き破って絶縁ボール９内に部分圧入する。

【００３５】上記メタルコート導電ボールは既知の技術により微小径で均一な大きさに造球することが容易で、導電バンプ３の高さの不揃いを是正できる。

【００３６】図１、図２、図３、図４、図５に示すように、上記各導電粒子４は合成樹脂製フレキシブル絶縁フィルム１の表面と略平行な突出レベルＬとなるように圧入によって植設する。

【００３７】上記導電粒子４の導電バンプ３頂面への圧入及び上記突出レベルＬの設定は図６の方法によって行なう。先ず、前記のように合成樹脂製フレキシブル絶縁フィルム１の表面にリード２をメッキ成長させて所要の配線パターンを形成した配線板を用意し、次でこのリード２表面のＩＣ外部接点と対応した位置に導電バンプ３を付設し、他方図６Ａ，Ｂに示すように、平面７上に導電粒子４を散布し、この導電粒子４の散布面に上記配線板を導電バンプ３と導電粒子４とが対向するように重ね、配線板全体を平行に加圧する。この結果各導電バンプ３の頂面３ｂに導電粒子４が均一に押し付けられて圧入されるに至る。

【００３８】上記の如く導電粒子４を平面７上に敷並べ、これに導電バンプ３を押し付けて圧入する方法を採ることにより粒子の大きさにバラツキがあっても、導電粒子４は平面７のレベルにおいて上記圧入がなされ、絶縁フィルム１の表面と略平行な突出レベルＬを以って植設する構造が得られる。

【００３９】同時に上記圧入法によって導電粒子４は山形の導電バンプ３の頂面に限定して圧入され植設した構造が得られる。又導電バンプ３を前記の通り軟質金属にすることにより圧入初期における粒子の滑りを抑止し、バンプ３の傾面に対しても比較的容易に圧入し、圧入深さを確保できる。

【００４０】又導電バンプの表面に適当な溶剤を塗布するか或いは加熱して表面を軟化状態にした上で上記散布粒子に押し付け圧入を促進することができる。

【００４１】図２に示すように、上記導電粒子４の植設強度を強化するため、上記導電バンプ３及び導電粒子４の表面を軟質金属膜８で一体に覆う。

【００４２】この金属膜８はメッキ或いはスパッタ、両者の組合せによりコーティングして膜付け強度を強化し、導電粒子４の脱落を有効に防止する。

【００４３】又上記導電バンプ３はメッキにより形成する他、導電ペーストを印刷法によってリード表面に山形に付設し、熱処理によりリード表面に強固に結合せしめる。

【００４４】導電ペーストは金属粉と合成樹脂ペーストを混練したもので、金属粉は一般的にはニッケル、半田、銅、金等である。

【００４５】図７は図１乃至図６に基いて説明した技術に基いて液晶板の検査に用いるプローブユニットを構成した例を示す。

【００４６】前記のようにベース板として合成樹脂製フレキシブル絶縁フィルム１を用い、その表面に配線パターンとして直線状の導電リード２′を並列してメッキ成長させ、該導電リード２′の先端部表面に前記軟質金属から成る導電バンプ３を付設し、この導電バンプ３の頂面に限定して導電粒子４を圧入により植設する。

【００４７】この導電バンプ３を導電粒子４を以って液晶板等の電極に弾力的に加圧接触させ、健全な接触を得るものである。

【００４８】液晶板の電極はＩＣ等と同様、微小ピッチ化が非常に進んでおり、従来の金属板から打抜いたリード等では対処困難な状況にある。本発明は斯る液晶板の検査用に用いるプローブユニットとして有効に適用できるものである。

【００４９】導電リード及び導電バンプの形成方法とその材質、導電粒子の植設法及びその材質等、又絶縁カバ

ーコートの付設等については図１乃至図３に基く記載を援用する。

【００５０】図示はしないが、本発明の他の実施形態例として上記導電バンプ３を導電粒子４を以って電子部品５の外部接点６に加圧接触させた後、バンプ３と外部接点間に合成樹脂（接着剤）を注入し両者３，６を固く結合し、粒子圧入による接触状態を健全に維持することができる。

【００５１】

【発明の効果】本発明によれば、合成樹脂製フレキシブル絶縁フィルム上に配線パターンを施した配線板により、電子部品の外部接点の微小ピッチ化に有効に対処できると共に、該リード表面に付設した導電バンプの接圧不全を同バンプ頂面に圧入し植設したギザギザの表面を有する導電粒子により高接圧を以って健全なバンプ接触が果たせ、加えてベース板たる合成樹脂製フレキシブル絶縁フィルムの可撓性により上記導電粒子の接触面における外部接点の高さのバラツキを有効に解消し、導電粒子による接触効果を有効に生かせる。

【００５２】又上記硬質の導電粒子を軟質の導電バンプに圧入によって植設する構造により、より均一な植設が容易に行なえ、又突出レベルをフィルム表面と略平行に揃えることによって導電粒子個々の接触面に対する喰い込み作用を充分に発揮させることができる。

【００５３】又絶縁カバーコートの存在により、仮に導電粒子の脱落が生じてもリード間短絡を有効に防止でき、又圧入時における不必要部への粒子付着を効果的に防止する。

【図面の簡単な説明】

【図１】本発明に係る電子部品接触用フレキシブル配線板の第１実施形態例を示す要部拡大断面図であり、各導電バンプをＢＧＡ形ＩＣパッケージの外部接点たる導電ボールと、ベアＩＣ又はリードレス形ＩＣパッケージの外部接点たる導電箔に夫々加圧接触した状態を説明する図である。

【図２】本発明の第２実施形態例を、図１と同様の状態＊を以って示す要部拡大断面図である。

【図３】Ａ，Ｂ，Ｃ，Ｄは上記導電バンプの形成方法を工程順に示す断面図、Ｂ′はＢの状態における平面図である。

【図４】本発明の第３実施形態例を図１、図２と同様の状態を以って示す要部拡大断面図である。

【図５】本発明の第４実施形態例を示す導電バンプの拡大断面図である。

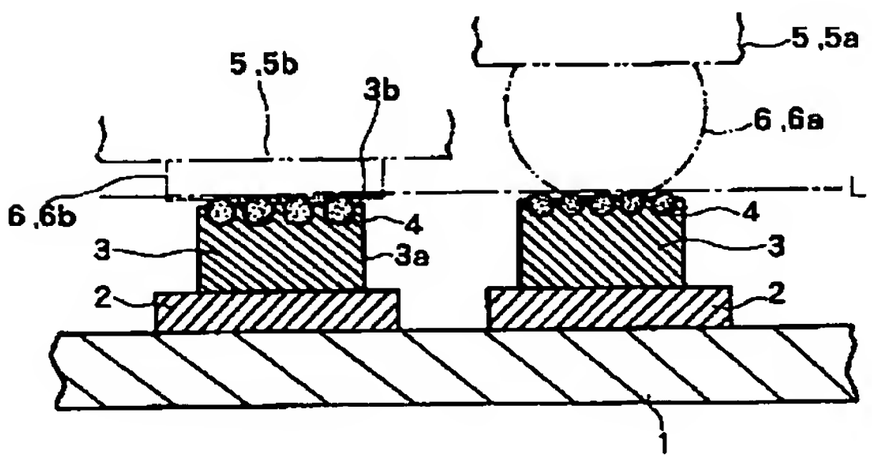
【図６】Ａ；Ｂは導電バンプに導電粒子を圧入によって植設する工程を示す要部拡大断面図である。

【図７】本発明の第５実施形態例を示すプローブユニットの斜視図である。

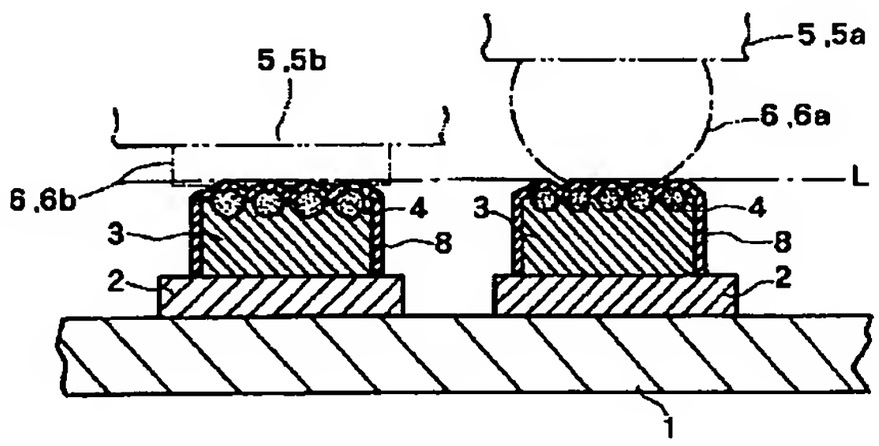
【符号の説明】

１		合成樹脂製フレキシブル絶縁フィルム
２，２′		導電リード
３		導電バンプ
３ａ		同バンプの周囲側面
３ｂ		同バンプの頂部表面
４		導電粒子
５		電子部品
５ａ		ＩＣ本体
５ｂ		ベアＩＣ本体
６		外部接点
６ａ		導電ボール
６ｂ		導電箔
７		平面
８		金属膜
９		絶縁ボール
１０		導電金属膜
１２		絶縁カバーコート
１３		小孔
１４		小径基部
１５		大径頂部
１６		感光レジスト層
１７		小孔
Ｌ		突出レベル

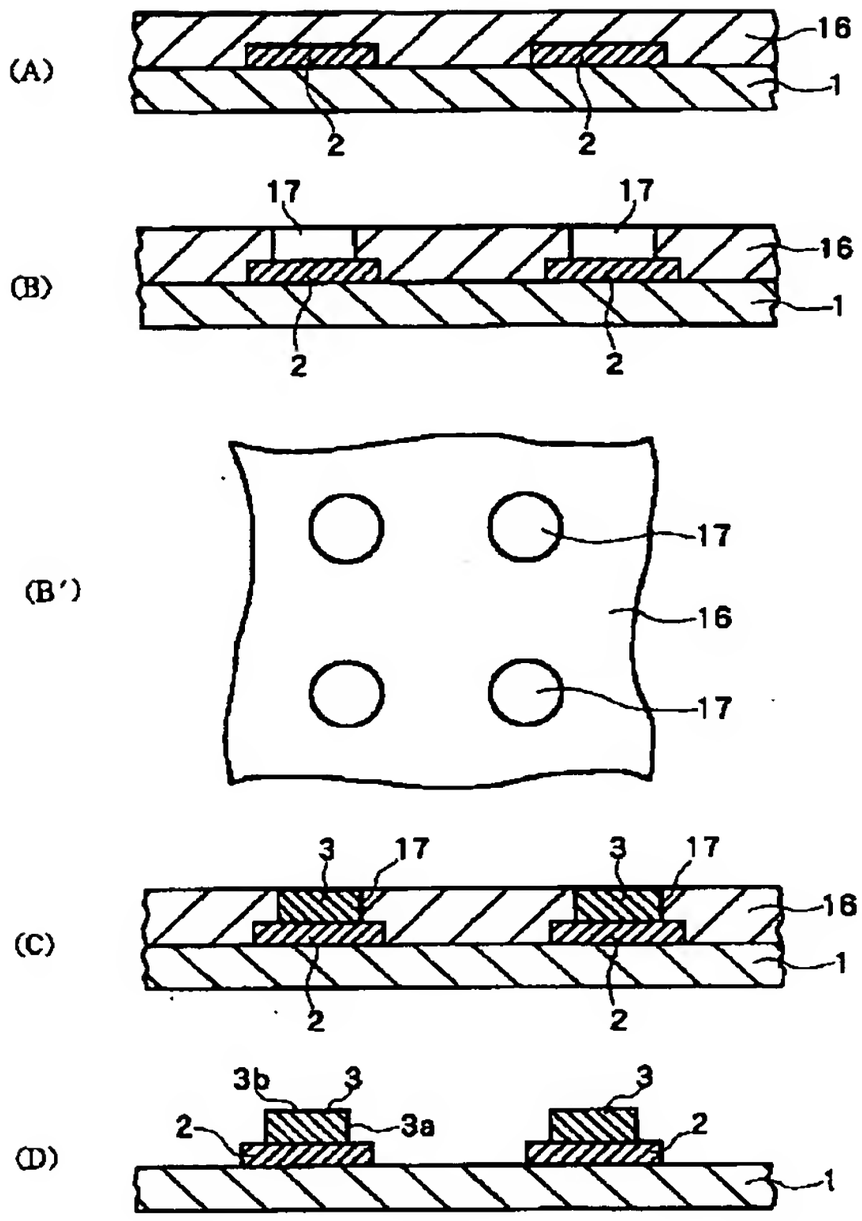
【図１】



【図２】



【図３】


(A)
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(B)
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(B')
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(C)
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(D)
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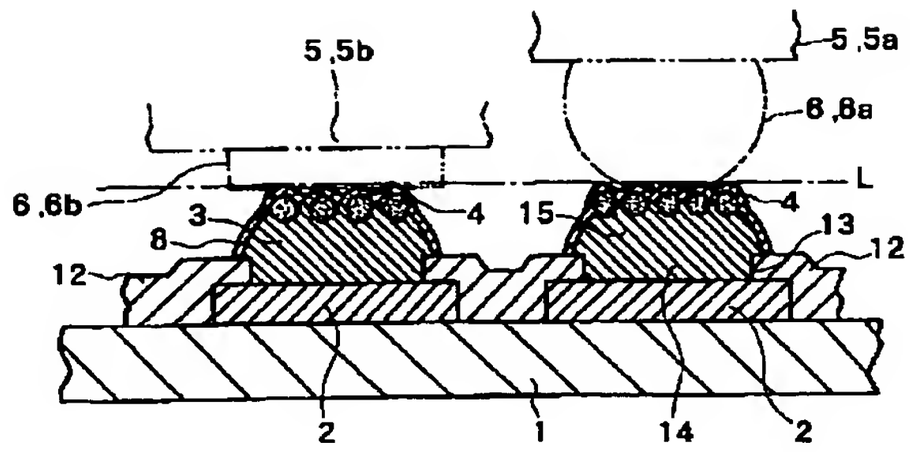
【図４】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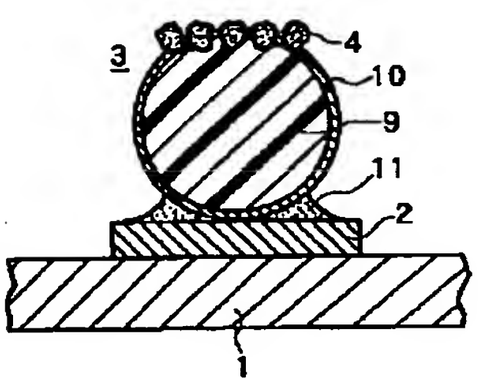
【図５】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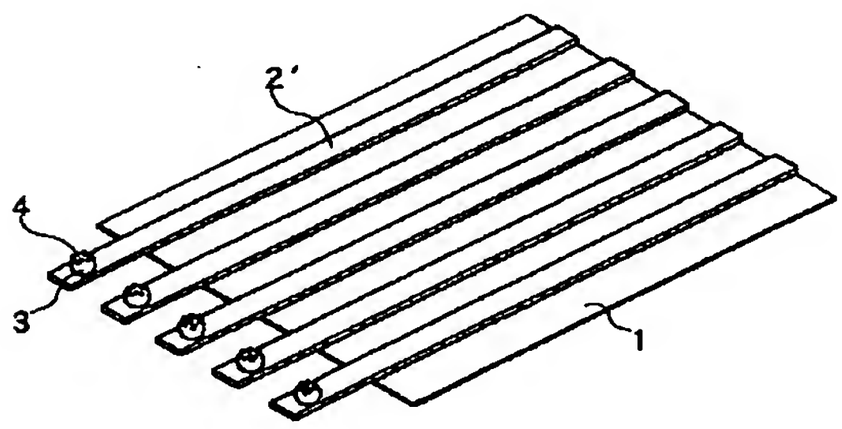
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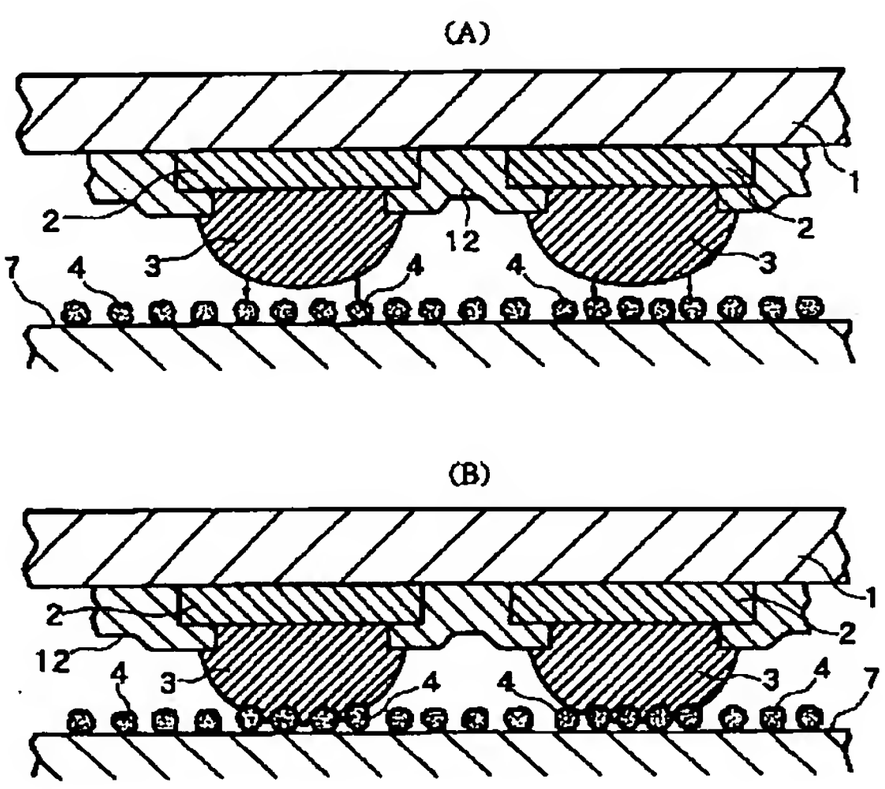
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7

【手続補正書】
【提出日】平成８年１２月１２日
【手続補正１】
【補正対象書類名】明細書
【補正対象項目名】００２１
【補正方法】変更
【補正内容】
【００２１】上記導電バンプ３は一例として図３に示す方法によって形成する。先ず図３Ａに示すように、合成樹脂製フレキシブル絶縁フィルム１及びリード２を覆う感光レジスト層１６を形成し、この感光レジスト層１６に導電バンプの配置に対応した円形の小孔を有するマスクを被せてこの小孔内の感光レジスト層部を露光し、この露光部を除去して図３Ｂ，Ｅに示す如く、感光レジスト層１６にリード表面において開口する平面視円形の小孔１７を形成し、図３Ｃに示す如くこの小孔１７内においてリード表面に導電バンプ３をメッキ成長させ、次に図３Ｄに示すように、レジスト層１６を除去する。この導電バンプ３は側面３ａが垂直で且つ平面視円形であり、頂面３ｂが略平面である。
【手続補正２】
【補正対象書類名】明細書
【補正対象項目名】図面の簡単な説明
【補正方法】変更
【補正内容】
【図面の簡単な説明】
【図１】本発明に係る電子部品接触用フレキシブル配線板の第１実施形態例を示す要部拡大断面図であり、各導電バンプをＢＧＡ形ＩＣパッケージの外部接点たる導電ボールと、ベアＩＣ又はリードレス形ＩＣパッケージの外部接点たる導電箔に夫々加圧接触した状態を説明する図である。
【図２】本発明の第２実施形態例を、図１と同様の状態を以って示す要部拡大断面図である。
【図３】Ａ，Ｂ，Ｃ，Ｄは上記導電バンプの形成方法を工程順に示す断面図、ＥはＢの状態における平面図である。
【図４】本発明の第３実施形態例を図１、図２と同様の状態を以って示す要部拡大断面図である。
【図５】本発明の第４実施形態例を示す導電バンプの拡大断面図である。
【図６】Ａ，Ｂは導電バンプに導電粒子を圧入によって植設する工程を示す要部拡大断面図である。
【図７】本発明の第５実施形態例を示すプローブユニットの斜視図である。
【符号の説明】
１　　合成樹脂製フレキシブル絶縁フィルム
２，２′　　導電リード
３　　導電バンプ
３ａ　　同バンプの周囲側面
３ｂ　　同バンプの頂部表面
４　　導電粒子
５　　電子部品
５ａ　　ＩＣ本体
５ｂ　　ベアＩＣ本体
６　　外部接点
６ａ　　導電ボール
６ｂ　　導電箔
７　　平面
８　　金属膜
９　　絶縁ボール
１０　　導電金属膜
１２　　絶縁カバーコート
１３　　小孔
１４　　小径基部
１５　　大径頂部
１６　　感光レジスト層
１７　　小孔
Ｌ　　突出レベル
【手続補正３】
【補正対象書類名】図面
【補正対象項目名】図３
【補正方法】変更
【補正内容】
【図３】

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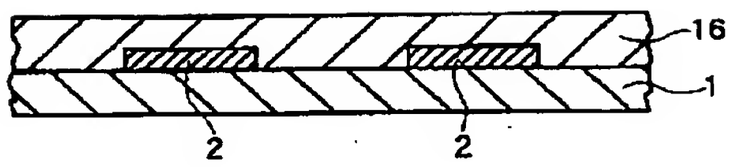

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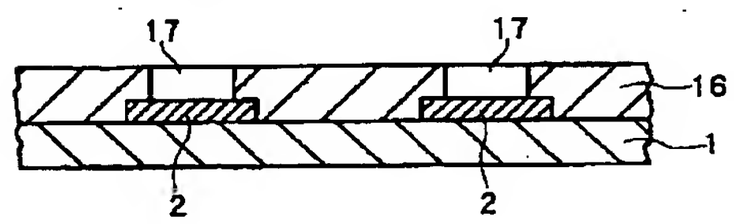

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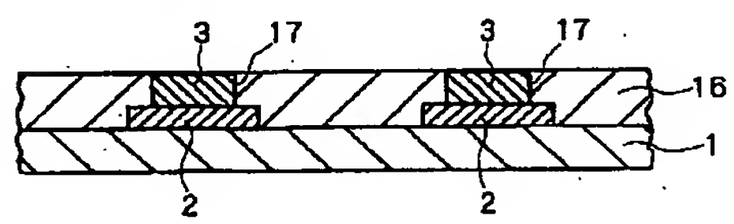

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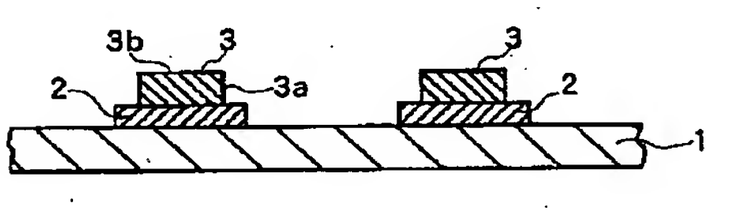

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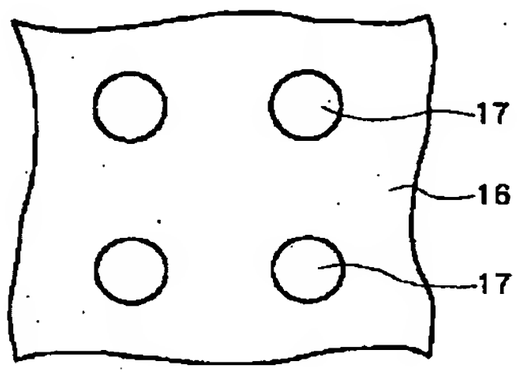


PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-115637
(43)Date of publication of application : 06.05.1998

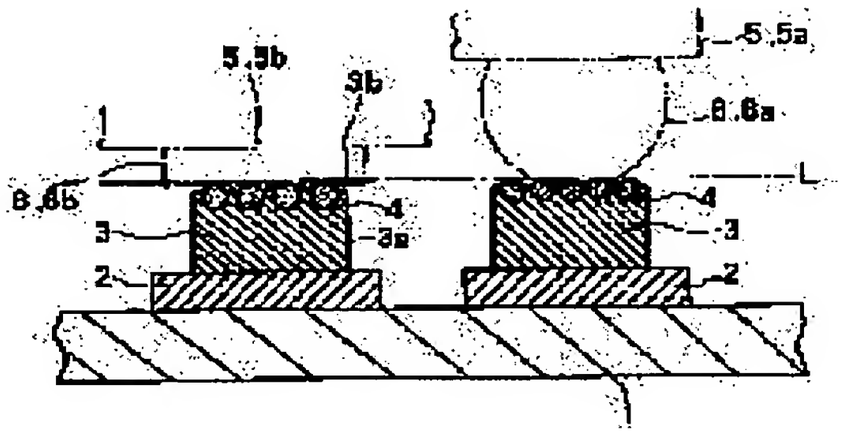
(51)Int.Cl. G01R 1/073
G01R 31/26
H01L 21/66
H05K 1/09
H05K 1/11

(21)Application number : 08-270984
(22)Date of filing : 14.10.1996

(71)Applicant : YAMAICHI ELECTRON CO LTD
(72)Inventor : SUZUKI NOBUSHI
YONEZAWA AKIRA

(54) FLEXIBLE WIRING BOARD FOR CONTACT WITH ELECTRONIC COMPONENT

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a flexible wiring board whose contact with a fine-pitch and fine external contact at an electronic component can be ensured stably and with high reliability by a method wherein conductive particles are planted and installed so as to be limited to the top surface of every conductive bump which is installed on a conductive lead.
SOLUTION: Every conductive lead 2 is grown, by a plating operation, on the surface of a synthetic-resin insulating film 1, and a required wiring pattern is formed. Every soft metal conductive bump 3 is formed additionally on the surface of every conductive lead 2 with reference to every external contact 6 at an electronic component 5. Then, a plurality of particles 4 which are composed of a rigid metal and which has a notched surface are force-fitted, planted and installed so as to be limited to the top surface of every conductive bump 3. A part of the conductive particles 4 protruding from the top surface of every conductive
bump 3 is used as a pressurization contact with every external contact 6 at the electronic component 5 such as an IC or the like so as to supplement a contact by every conductive bump 3. Thereby, a flexible wiring board whose contact with every fine-pitch and fine external contact at the electronic component can be ensured stably and with high reliability can deal effectively with the fine pitch of every conductive lead.



LEGAL STATUS

[Date of request for examination] 14.10.1996

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]	
[Patent number]	2944537
[Date of registration]	25.06.1999
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The flexible patchboard for electronic-parts contact characterized by implanting two or more electric conduction particles which give a circuit pattern to the front face of the flexible insulation film made of synthetic resin, prepare the electric conduction bump who consists of an elasticity metal in the front face of the electric conduction lead which forms this circuit pattern, limit to this electric conduction bump's top front face, and consist of a hard metal by press fit.
[Claim 2] A circuit pattern is given to the front face of the flexible insulation film made of synthetic resin. The front face of this insulating film and a circuit pattern is covered to one with an insulating cover coat. The electric conduction bump who consists of an elasticity metal is prepared in the front face of the electric conduction lead which forms the above-mentioned circuit pattern. The patchboard for electronic-parts contact characterized by implanting the electric conduction particle of a large number which the stoma which prepared this electric conduction bump in the insulating cover coat is made to project from the through said cover coat front face, limit to this electric conduction bump's lobe top face, and consist of a hard metal by press fit.
[Claim 3] each above-mentioned electric conduction bump -- the front face of the flexible insulation film made of synthetic resin, and abbreviation -- parallel protrusion level -- with -- **** -- the flexible patchboard for electronic-parts contact according to claim 1 or 2 characterized by being implanted.
[Claim 4] The flexible patchboard for electronic-parts contact according to claim 1 or 2 characterized by for the above-mentioned circuit pattern changing from the electric conduction lead which carried out the parallel arrangement to the front face of the flexible insulation film made of synthetic resin, and forming the electric conduction bump in the point front face of this electric conduction lead.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the flexible patchboard for electronic-parts contact used at the time of inspection of electronic parts, such as a BGA (ball grid array) form IC package, and raise in basic wages IC, an MCM substrate (multi chip module substrate), etc.
[0002]
[Description of the Prior Art] High integration of IC used for this and a micrifying inclination progressed further with rapid progress of the formation of small lightweight of the latest electronic equipment, and high-performance-izing, and detailed-izing of an external contact and high density are brought about.
[0003] With the socket of the method which presses the tip of a contact probe like before against an external contact depending on these ICs, it is difficult to deal with ****** pitch-ization, and proper contact is becoming difficult to get.
[0004]
[Problem(s) to be Solved by the Invention] Then, the applicant made the front face of the lead which the front face of the flexible insulation film made of synthetic resin is made to carry out plating growth of the circuit pattern, and forms this circuit pattern in it carry out plating growth of the electric conduction bump, and the approach of pressing against the external contact (an electric conduction ball and electric conduction foil) of a BGA form IC package or raise in basic wages IC was tried, backing this up with an elastic rubber sheet etc.
[0005] This approach has the advantage which can contact in imitation to the external contact and bump who can wire a lead in a minute pitch by plating or etching, and have variation in height by the flexible nature of a film, and brought about the improvement in that it can respond to minute pitch-ization of the external contact of IC.
[0006] However, although it must carry out sharpening an electric conduction bump's tip in a cone form etc. for breaking through an oxide skin in the external contact (said electric conduction ball and electric conduction foil) of the opposite side IC, and the point of contact of an electric conduction bump's minute area, and securing the contact nature of high reliance and contact pressure must be raised It is very difficult to carry out size enlargement of the minute bump to an acute form by technique, such as plating or printing of soldering paste, in addition to being hard to avoid the variation in an electric conduction bump's height as aforementioned. So, it becomes a technical problem to solve this trouble and to guarantee the stability and dependability of electrical machinery-contact, and the advantage which can cope with minute pitch-ization by this solution can be employed efficiently.
[0007]
[Means for Solving the Problem] This invention offers the flexible patchboard for electronic-parts contact which responds to the above-mentioned technical request.
[0008] The configuration this invention makes a contact means the patchboard which gave the circuit pattern, and made it make whose flexible nature participate in contact, using the flexible insulation film made of synthetic resin as a wiring substrate, The configuration which planned concentration point contact by the electric conduction bump who consists of the elasticity metal

prepared in the lead front face which forms the above-mentioned circuit pattern, The configuration which implants two or more electric conduction particles which limit to this electric conduction bump's top front face, and consist of a hard metal by press fit, and complemented contact by the above-mentioned bump carries out the complementation, and the stable contact of high reliance over a detailed external contact can be secured in the minute pitch of electronic parts. It can be coped with effective in the formation of a minute pitch of the lead which is an ultimate technical problem.

[0009] The flexible insulation film made of synthetic resin used as the substrate of the above-mentioned patchboard absorbs effectively the external contact of IC, and the variation of an electric conduction bump's height by the flexible nature. Moreover, it is coped with effective in the formation of a minute pitch of IC external contact with the circuit pattern (lead) which wired this film front face by plating or etching.

[0010] Moreover, it eats at the external contact of IC certainly, being accompanied by the flexible nature of a film by the electric conduction particle implanted in an electric conduction bump's top front face established in the front face of the above-mentioned lead.

[0011] This electric conduction particle is implanted in the electric conduction bump who consists of an elastic metal from this by press fit, and makes very easy exposure implantation of an electric conduction particle to a minute electric conduction bump.

[0012] Moreover, it is made the structure which implants the protrusion level of two or more electric conduction particles in abbreviation homogeneity by adoption of this press fit implantation means, protrusion level of an electric conduction particle is made into homogeneity, and homogeneity is made to carry out pressurization contact of each electric conduction particle to the external contact of IC.

[0013] Moreover, prepare a wrap insulation cover coat for the above-mentioned flexible insulation film made of synthetic resin, and a circuit pattern, the above-mentioned electric conduction bump is made to project through the stoma of this cover coat, it limits to this lobe top face, and the above-mentioned electric conduction particle is implanted by press fit.

[0014] Even if it can expand the top surface area of the electric conduction bump who projects from a stoma, it implants the electric conduction particle of sufficient amount for this expansion side and it expands an electric conduction bump by existence of the above-mentioned cover coat, the short circuit between bumps is prevented effectively.

[0015] In the probe unit used for inspection of a liquid crystal plate, the front face of the flexible insulation film made of synthetic resin is made to carry out plating growth of the juxtaposition lead group, said electric conduction bump is prepared in the point front face of this juxtaposition lead group, it limits to this electric conduction bump's top front face, and an electric conduction particle is implanted in constant level by press fit.

[0016] Contact of high reliance is secured to the electrode (external contact) of a minute pitch installed by the edge of a liquid crystal plate by this.

[0017]

[Embodiment of the Invention] Hereafter, the example of an operation gestalt of the flexible patchboard for electronic-parts contact concerning this invention is explained in full detail based on drawing 1 thru/or drawing 7 .

[0018] The above-mentioned patchboard is using the flexible insulation film 1 made of synthetic resin as the base.

[0019] As shown in drawing 1 thru/or drawing 4 , the circuit pattern by plating or etching is formed in the front face of this insulation film 1 made of synthetic resin. That is, the electric conduction lead 2 which forms a circuit pattern is made to grow by plating, or it etches into a conductive layer, and a necessary pattern is formed. The method of growing up lead 2 by plating forms a conductive layer and a sensitization resist layer in the front face of the flexible insulation film 1 made of synthetic resin as an example. The mask according to a circuit pattern is put and exposed on the front face of this sensitization resist layer. The resist pattern according to a circuit pattern is formed by removing this exposure section. After making the front face of an exposure **** conductive layer part carry out plating growth of the electric conduction lead, forming a circuit pattern between this resist pattern and removing a

sensitization resist pattern, between the leads which remove the conductive layer part between this circuit pattern by etching, and form a circuit pattern is isolated mutually. Or it only etches into a conductive layer and a necessary circuit pattern is formed.
[0020] The electric conduction bump 3 who consists of an elasticity metal is attached to the front face of the electric conduction lead 2 which forms the above-mentioned circuit pattern corresponding to the external contact 6 of electronic parts 5. The electric conduction bump 3 who shows drawing 1 and drawing 2 is a vertical plane, and does the ** form of the perimeter side-face 3a to a plane view round shape, and makes top-face 3b the approximate plane. The case where it is made the arc form face this flat surface of whose is curvature and which becomes size is included.
[0021] The above-mentioned electric conduction bump 3 forms by the approach shown in drawing 3 as an example. As first shown in drawing 3 A, the wrap sensitization resist layer 16 is formed for the flexible insulation film 1 made of synthetic resin, and lead 2. Put the mask which has a circular stoma corresponding to arrangement of an electric conduction bump on this sensitization resist layer 16, and the sensitization resist layer in this stoma is exposed. As this exposure section is removed and it is shown in drawing 3 B and B', the stoma 17 of the plane view round shape which carries out opening to the sensitization resist layer 16 in a lead front face is formed. Next, as are shown in drawing 3 C, and plating growth is carried out and the electric conduction bump 3 is shown in a lead front face in this stoma 17 at drawing 3 D, the resist layer 16 is removed. This electric conduction bump 3 has perpendicular side-face 3a, and it is a plane view round shape, and top-face 3b is an approximate plane.
[0022] And two or more electric conduction particles 4 which have the notched front face which limits to the above-mentioned electric conduction bump's 3 top surface 3b, and consists of a hard metal are implanted by press fit, and pressurization contact at the external contact 6 of the electronic parts 5, such as IC, is presented with the electric conduction particle part which projects from this bump's 3 top surface 3b.
[0023] The above-mentioned electronic parts 5 are BGA form IC packages which have electric conduction ball 6a (external contact 6) arranged in the minute pitch in raise in basic wages IC on the inferior surface of tongue of a built-in **** IC body at high density, or are IC chips which have electric conduction foil 6b (external contact 6) arranged in the minute pitch on the inferior surface of tongue of raise in basic wages IC body 5b at high density. Moreover, this invention can be carried out to the lead loess form IC package which allotted much external contact slack electric conduction foil 6b to the inferior surface of tongue of IC package body.
[0024] A polyimide resin film or a liquid crystal polymer film is used for the above-mentioned flexible insulation film 1 made of synthetic resin as a good example. Both this film has thermal resistance and the good plating nature of a lead, and telescopic motion by heat is fitness few. Furthermore, a liquid crystal polymer film does not have hygroscopicity, and can prevent the dimensional change by moisture absorption, and a dielectric constant is low excellent in the property as a wiring substrate, its thermal conductivity is still better and it is excellent in the cooling effect.
[0025] Moreover, as an elasticity metal which forms the above-mentioned electric conduction bump 3, tinning, solder plating, the thing that gold-plated, gold, solder, or conductive paste is suitable for nickel.
[0026] Moreover, as a hard metal which forms the above-mentioned electric conduction particle 4, a diamond, cobalt, nickel, or super-steel is used.
[0027] Next, the example shown in drawing 4 made the front face of the flexible insulation film 1 made of base plate slack synthetic resin carry out plating growth of the circuit pattern, and has covered the front face of this insulating film 1 and a circuit pattern to one with the insulating cover coat 12.
[0028] And it is the structure which implanted the electric conduction particle 4 of a large number which the stoma 13 which formed the electric conduction bump 3 who consists of an elasticity metal in the front face of the electric conduction lead 2 which forms the above-mentioned circuit pattern, and formed this electric conduction bump 3 in the above-mentioned insulating cover coat 12 is made to project from the through said cover coat front face, limit to

this electric conduction bump's lobe top face, and consist of a hard metal by press fit.
[0029] The above-mentioned insulating cover coat consists of a synthetic-resin film, and what established the stoma 13 of a large number corresponding to the external contact of IC is prepared for the predetermined location of this film. The lead 2 which puts this ****** film on the front face of the above-mentioned flexible insulation film 1 made of base plate slack synthetic resin, for example, carries out base material weld, and forms a circuit pattern with a wrap A lead front face is exposed at the bottom in each stoma 13, and plating growth of the electric conduction bump 3 is carried out into this stoma 13, and it is made to project from the effective area (cover coat 12 front face) of a stoma 13.
[0030] This lobe (crowning) of the electric conduction bump 3 who projects from the front face of a cover coat 12 is made into a major diameter, and makes a lobe periphery edge stick to the opening edge front face of a stoma 13 from a stoma 13 at this time. When it puts in another way, she has the crowning 15 of a major diameter from the base 14 of the minor diameter firmly combined with a lead front face, and the base 14 which upheaves from the effective area of a stoma 13 to an umbrella form, the electric conduction bump 3 filling the inside of a stoma 13, and sticking to a stoma inside.
[0031] The diameter of this crowning 15 can be expanded by existence of the insulating cover coat 12, and by this diameter expansion, it increases top surface area and presses the electric conduction particle 4 of requirements fit in this top front face.
[0032] The fault dropped out and short-circuited between leads of the electric conduction particle 4 is canceled, and even if it drops out on a cover coat 12, it will not result in the short circuit between ** bumps immediately, but making it fall easily from a cover coat front face etc. can remove by recognizing existence of the above-mentioned insulating cover coat 12.
[0033] Moreover, as shown in drawing 4 , by existence of a cover coat 12, it prevents effectively that this particle 4 adheres between leads and to a bump's 3 side face at the time of press fit of the electric conduction particle 4.
[0034] Next, drawing 5 has illustrated the case where the above-mentioned electric conduction bump 3 is formed with a metal coat electric conduction ball. This metal coat electric conduction ball has the structure which coated the electric conduction metal membrane 10 which changes from said illustrated elasticity metal to the peripheral surface of the insulating balls 9, such as a plastic bowl and a ceramic ball, pastes up this metal coat electric conduction ball on the front face of the electric conduction lead 2 firmly through conductive paste 11, and implants the electric conduction particle 4 in the electric conduction metal membrane 10 of this ball top face by press fit. At this time, the electric conduction particle 4 breaks through the electric conduction metal membrane 10, and carries out partial press fit into the insulating ball 9.
[0035] The above-mentioned metal coat electric conduction ball is easy to **** in uniform magnitude with the diameter of minute with a known technique, and the non-set of the electric conduction bump's 3 height can be corrected.
[0036] it is shown in drawing 1 , drawing 2 , drawing 3 , drawing 4 , and drawing 5 -- as -- each above-mentioned electric conduction particle 4 -- the front face of the flexible insulation film 1 made of synthetic resin, and abbreviation -- it implants by press fit so that it may be set to the parallel protrusion level L.
[0037] The press fit to electric conduction bump 3 top face of the above-mentioned electric conduction particle 4 and a setup of the above-mentioned protrusion level L are performed by the approach of drawing 6 . First, the patchboard which the front face of the flexible insulation film 1 made of synthetic resin was made to carry out plating growth of the lead 2, and formed the necessary circuit pattern in it as mentioned above is prepared. As the electric conduction bump 3 is attached to IC external contact of this lead 2 front face, and the corresponding location next and it is shown in another side drawing 6 A and B The electric conduction particle 4 is sprinkled on a flat surface 7, it piles up so that the electric conduction bump 3 and the electric conduction particle 4 may counter the diffusional aspect of this electric conduction particle 4 in the above-mentioned patchboard, and the whole patchboard is pressurized in parallel. As a result, the electric conduction particle 4 is forced on homogeneity, and comes to be pressed fit in each electric conduction bump's 3 top-face 3b.

[0038] even if variation is in the magnitude of a particle by taking the approach of forcing ****** on a flat surface 7, forcing the electric conduction bump 3 against this, and pressing the electric conduction particle 4 fit like the above, in the level of a flat surface 7, the above-mentioned press fit should do the electric conduction particle 4 -- the front face of the insulating film 1, and abbreviation -- the parallel protrusion level L -- with -- **** -- the structure to implant is acquired.
[0039] The structure which the electric conduction particle 4 was limited and pressed fit in the top face of the electric conduction bump 3 of Yamagata by the above-mentioned pressure process, and was implanted at coincidence is acquired. Moreover, by using the electric conduction bump 3 as an elasticity metal as aforementioned, slipping of the particle in the early stages of press fit is inhibited, it presses fit comparatively easily also to a bump's 3 slope, and the press fit depth can be secured.
[0040] or [moreover, / applying the suitable solvent for an electric conduction bump's front face] -- or after heating and changing a front face into a softening condition, it can push against the above-mentioned spraying particle, and press fit can be promoted.
[0041] As shown in drawing 2 , in order to strengthen the implantation reinforcement of the above-mentioned electric conduction particle 4, it is a wrap to one at the elasticity metal membrane 8 about the front face of the above-mentioned electric conduction bump 3 and the electric conduction particle 4.
[0042] This metal membrane 8 is coated with the combination of plating or a spatter, and both, strengthens film attachment reinforcement, and prevents omission of the electric conduction particle 4 effectively.
[0043] Moreover, the above-mentioned electric conduction bump 3 forms by plating, and also attaches conductive paste to a lead front face by print processes in Yamagata, and makes it combine with a lead front face firmly by heat treatment.
[0044] Conductive paste is what kneaded the metal powder and the synthetic-resin paste, and, generally metal powders are nickel, solder, copper, gold, etc.
[0045] Drawing 7 shows the example which constituted the probe unit used for inspection of a liquid crystal plate based on the technique explained based on drawing 1 thru/or drawing 6 .
[0046] As mentioned above, straight-line-like electric conduction lead 2' is arranged in parallel as a circuit pattern on that front face, using the flexible insulation film 1 made of synthetic resin as a base plate, plating growth is carried out, the electric conduction bump 3 who changes from said elasticity metal to the point front face of this electric conduction lead 2' is attached, it limits to this electric conduction bump's 3 top face, and the electric conduction particle 4 is implanted by press fit.
[0047] this electric conduction bump 3 -- the electric conduction particle 4 -- with -- **** -- pressurization contact is flexibly carried out to electrodes, such as a liquid crystal plate, and healthy contact is acquired.
[0048] Like IC etc., minute pitch-ization is progressing very much and the electrode of a liquid crystal plate is in a situation with difficult management by the lead pierced from the conventional metal plate. This invention is effectively applicable as a probe unit used for checking of a **** liquid crystal plate.
[0049] An electric conduction lead and an electric conduction bump's formation approach, the quality of the material and the method of implanting an electric conduction particle, its quality of the material, etc. use the publication based on drawing 1 thru/or drawing 3 about the attachment of an insulation cover coat.
[0050] although illustration is not carried out -- as other examples of an operation gestalt of this invention -- the above-mentioned electric conduction bump 3 -- the electric conduction particle 4 -- with -- **** -- after making the external contact 6 of electronic parts 5 carry out pressurization contact, synthetic resin (adhesives) can be poured in between external contacts with a bump 3, both 3 and 6 can be combined firmly, and the contact condition by particle press fit can be maintained healthfully.
[0051]
[Effect of the Invention] According to this invention, with the patchboard which gave the circuit

pattern on the flexible insulation film made of synthetic resin, while being able to cope with it effective in the formation of a minute pitch of the external contact of electronic parts Healthy bump contact can be achieved. the electric conduction particle which has the notched front face which pressed fit and implanted in this bump top face an electric conduction bump's contact pressure incompetence attached to this lead front face -- a high contact pressure -- with -- **** -- In addition, the variation in the height of the external contact in the contact surface of the above-mentioned electric conduction particle is effectively canceled by the flexibility of the flexible insulation film made of base plate slack synthetic resin, and the exposure effect by the electric conduction particle can be employed efficiently effectively.

[0052] Moreover, by being able to perform more uniform implantation easily and arranging protrusion level with a film front face and abbreviation parallel according to the structure which implants the above-mentioned hard electric conduction particle in an elastic electric conduction bump by press fit, it can eat to the contact surface of electric conduction particle each, and a lump operation can fully be demonstrated.

[0053] Moreover, by existence of an insulating cover coat, even if omission of an electric conduction particle arise, the short circuit between leads can be prevented effectively, and particle adhesion in the unnecessary section at the time of press fit is prevented effectively.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the flexible patchboard for electronic-parts contact used at the time of inspection of electronic parts, such as a BGA (ball grid array) form IC package, and raise in basic wages IC, an MCM substrate (multi chip module substrate), etc.

[Translation done.]

* NOTICES *

PRIOR ART

[Description of the Prior Art] High integration of IC used for this and a micrifying inclination progressed further with rapid progress of the formation of small lightweight of the latest electronic equipment, and high-performance-izing, and detailed-izing of an external contact and high density are brought about.

[0003] With the socket of the method which presses the tip of a contact probe like before against an external contact depending on these ICs, it is difficult to deal with ****** pitch-ization, and proper contact is becoming difficult to get.

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EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, with the patchboard which gave the circuit pattern on the flexible insulation film made of synthetic resin, while being able to cope with it effective in the formation of a minute pitch of the external contact of electronic parts Healthy bump contact can be achieved. the electric conduction particle which has the notched front face which pressed fit and implanted in this bump top face an electric conduction bump's contact pressure incompetence attached to this lead front face -- a high contact pressure -- with -- **** -- In addition, the variation in the height of the external contact in the contact surface of the above-mentioned electric conduction particle is effectively canceled by the flexibility of the flexible insulation film made of base plate slack synthetic resin, and the exposure effect by the electric conduction particle can be employed efficiently effectively.
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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Then, the applicant made the front face of the lead which the front face of the flexible insulation film made of synthetic resin is made to carry out plating growth of the circuit pattern, and forms this circuit pattern in it carry out plating growth of the electric conduction bump, and the approach of pressing against the external contact (an electric conduction ball and electric conduction foil) of a BGA form IC package or raise in basic wages IC was tried, backing this up with an elastic rubber sheet etc.
[0005] This approach has the advantage which can contact in imitation to the external contact and bump who can wire a lead in a minute pitch by plating or etching, and have variation in height by the flexible nature of a film, and brought about the improvement in that it can respond to minute pitch-ization of the external contact of IC.
[0006] However, although it must carry out sharpening an electric conduction bump's tip in a cone form etc. for breaking through an oxide skin in the external contact (said electric conduction ball and electric conduction foil) of the opposite side IC, and the point of contact of an electric conduction bump's minute area, and securing the contact nature of high reliance and contact pressure must be raised It is very difficult to carry out size enlargement of the minute bump to an acute form by technique, such as plating or printing of soldering paste, in addition to being hard to avoid the variation in an electric conduction bump's height as aforementioned. So, it becomes a technical problem to solve this trouble and to guarantee the stability and dependability of electrical machinery-contact, and the advantage which can cope with minute pitch-ization by this solution can be employed efficiently.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] This invention offers the flexible patchboard for electronic-parts contact which responds to the above-mentioned technical request.
[0008] The configuration this invention makes a contact means the patchboard which gave the circuit pattern, and made it make whose flexible nature participate in contact, using the flexible insulation film made of synthetic resin as a wiring substrate, The configuration which planned concentration point contact by the electric conduction bump who consists of the elasticity metal prepared in the lead front face which forms the above-mentioned circuit pattern, The configuration which implants two or more electric conduction particles which limit to this electric conduction bump's top front face, and consist of a hard metal by press fit, and complemented contact by the above-mentioned bump carries out the complementation, and the stable contact of high reliance over a detailed external contact can be secured in the minute pitch of electronic parts. It can be coped with effective in the formation of a minute pitch of the lead which is an ultimate technical problem.
[0009] The flexible insulation film made of synthetic resin used as the substrate of the above-mentioned patchboard absorbs effectively the external contact of IC, and the variation of an electric conduction bump's height by the flexible nature. Moreover, it is coped with effective in the formation of a minute pitch of IC external contact with the circuit pattern (lead) which wired this film front face by plating or etching.
[0010] Moreover, it eats at the external contact of IC certainly, being accompanied by the flexible nature of a film by the electric conduction particle implanted in an electric conduction bump's top front face established in the front face of the above-mentioned lead.
[0011] This electric conduction particle is implanted in the electric conduction bump who consists of an elastic metal from this by press fit, and makes very easy exposure implantation of an electric conduction particle to a minute electric conduction bump.
[0012] Moreover, it is made the structure which implants the protrusion level of two or more electric conduction particles in abbreviation homogeneity by adoption of this press fit implantation means, protrusion level of an electric conduction particle is made into homogeneity, and homogeneity is made to carry out pressurization contact of each electric conduction particle to the external contact of IC.
[0013] Moreover, prepare a wrap insulation cover coat for the above-mentioned flexible insulation film made of synthetic resin, and a circuit pattern, the above-mentioned electric conduction bump is made to project through the stoma of this cover coat, it limits to this lobe top face, and the above-mentioned electric conduction particle is implanted by press fit.
[0014] Even if it can expand the top surface area of the electric conduction bump who projects from a stoma, it implants the electric conduction particle of sufficient amount for this expansion side and it expands an electric conduction bump by existence of the above-mentioned cover coat, the short circuit between bumps is prevented effectively.
[0015] In the probe unit used for inspection of a liquid crystal plate, the front face of the flexible insulation film made of synthetic resin is made to carry out plating growth of the juxtaposition lead group, said electric conduction bump is prepared in the point front face of this juxtaposition lead group, it limits to this electric conduction bump's top front face, and an electric conduction

particle is implanted in constant level by press fit.
[0016] Contact of high reliance is secured to the electrode (external contact) of a minute pitch installed by the edge of a liquid crystal plate by this.
[0017]
[Embodiment of the Invention] Hereafter, the example of an operation gestalt of the flexible patchboard for electronic-parts contact concerning this invention is explained in full detail based on drawing 1 thru/or drawing 7 .
[0018] The above-mentioned patchboard is using the flexible insulation film 1 made of synthetic resin as the base.
[0019] As shown in drawing 1 thru/or drawing 4 , the circuit pattern by plating or etching is formed in the front face of this insulation film 1 made of synthetic resin. That is, the electric conduction lead 2 which forms a circuit pattern is made to grow by plating, or it etches into a conductive layer, and a necessary pattern is formed. The method of growing up lead 2 by plating forms a conductive layer and a sensitization resist layer in the front face of the flexible insulation film 1 made of synthetic resin as an example. The mask according to a circuit pattern is put and exposed on the front face of this sensitization resist layer. The resist pattern according to a circuit pattern is formed by removing this exposure section. After making the front face of an exposure **** conductive layer part carry out plating growth of the electric conduction lead, forming a circuit pattern between this resist pattern and removing a sensitization resist pattern, between the leads which remove the conductive layer part between this circuit pattern by etching, and form a circuit pattern is isolated mutually. Or it only etches into a conductive layer and a necessary circuit pattern is formed.
[0020] The electric conduction bump 3 who consists of an elasticity metal is attached to the front face of the electric conduction lead 2 which forms the above-mentioned circuit pattern corresponding to the external contact 6 of electronic parts 5. The electric conduction bump 3 who shows drawing 1 and drawing 2 is a vertical plane, and does the ** form of the perimeter side-face 3a to a plane view round shape, and makes top-face 3b the approximate plane. The case where it is made the arc form face this flat surface of whose is curvature and which becomes size is included.
[0021] The above-mentioned electric conduction bump 3 forms by the approach shown in drawing 3 as an example. As first shown in drawing 3 A, the wrap sensitization resist layer 16 is formed for the flexible insulation film 1 made of synthetic resin, and lead 2. Put the mask which has a circular stoma corresponding to arrangement of an electric conduction bump on this sensitization resist layer 16, and the sensitization resist layer in this stoma is exposed. As this exposure section is removed and it is shown in drawing 3 B and B', the stoma 17 of the plane view round shape which carries out opening to the sensitization resist layer 16 in a lead front face is formed. Next, as are shown in drawing 3 C, and plating growth is carried out and the electric conduction bump 3 is shown in a lead front face in this stoma 17 at drawing 3 D, the resist layer 16 is removed. This electric conduction bump 3 has perpendicular side-face 3a, and it is a plane view round shape, and top-face 3b is an approximate plane.
[0022] And two or more electric conduction particles 4 which have the notched front face which limits to the above-mentioned electric conduction bump's 3 top surface 3b, and consists of a hard metal are implanted by press fit, and pressurization contact at the external contact 6 of the electronic parts 5, such as IC, is presented with the electric conduction particle part which projects from this bump's 3 top surface 3b.
[0023] The above-mentioned electronic parts 5 are BGA form IC packages which have electric conduction ball 6a (external contact 6) arranged in the minute pitch in raise in basic wages IC on the inferior surface of tongue of a built-in **** IC body at high density, or are IC chips which have electric conduction foil 6b (external contact 6) arranged in the minute pitch on the inferior surface of tongue of raise in basic wages IC body 5b at high density. Moreover, this invention can be carried out to the lead loess form IC package which allotted much external contact slack electric conduction foil 6b to the inferior surface of tongue of IC package body.
[0024] A polyimide resin film or a liquid crystal polymer film is used for the above-mentioned flexible insulation film 1 made of synthetic resin as a good example. Both this film has thermal

resistance and the good plating nature of a lead, and telescopic motion by heat is fitness few. Furthermore, a liquid crystal polymer film does not have hygroscopicity, and can prevent the dimensional change by moisture absorption, and a dielectric constant is low excellent in the property as a wiring substrate, its thermal conductivity is still better and it is excellent in the cooling effect.

[0025] Moreover, as an elasticity metal which forms the above-mentioned electric conduction bump 3, tinning, solder plating, the thing that gold-plated, gold, solder, or conductive paste is suitable for nickel.

[0026] Moreover, as a hard metal which forms the above-mentioned electric conduction particle 4, a diamond, cobalt, nickel, or super-steel is used.

[0027] Next, the example shown in drawing 4 made the front face of the flexible insulation film 1 made of base plate slack synthetic resin carry out plating growth of the circuit pattern, and has covered the front face of this insulating film 1 and a circuit pattern to one with the insulating cover coat 12.

[0028] And it is the structure which implanted the electric conduction particle 4 of a large number which the stoma 13 which formed the electric conduction bump 3 who consists of an elasticity metal in the front face of the electric conduction lead 2 which forms the above-mentioned circuit pattern, and formed this electric conduction bump 3 in the above-mentioned insulating cover coat 12 is made to project from the through said cover coat front face, limit to this electric conduction bump's lobe top face, and consist of a hard metal by press fit.

[0029] The above-mentioned insulating cover coat consists of a synthetic-resin film, and what established the stoma 13 of a large number corresponding to the external contact of IC is prepared for the predetermined location of this film. The lead 2 which puts this ****** film on the front face of the above-mentioned flexible insulation film 1 made of base plate slack synthetic resin, for example, carries out base material weld, and forms a circuit pattern with a wrap A lead front face is exposed at the bottom in each stoma 13, and plating growth of the electric conduction bump 3 is carried out into this stoma 13, and it is made to project from the effective area (cover coat 12 front face) of a stoma 13.

[0030] This lobe (crowning) of the electric conduction bump 3 who projects from the front face of a cover coat 12 is made into a major diameter, and makes a lobe periphery edge stick to the opening edge front face of a stoma 13 from a stoma 13 at this time. When it puts in another way, she has the crowning 15 of a major diameter from the base 14 of the minor diameter firmly combined with a lead front face, and the base 14 which upheaves from the effective area of a stoma 13 to an umbrella form, the electric conduction bump 3 filling the inside of a stoma 13, and sticking to a stoma inside.

[0031] The diameter of this crowning 15 can be expanded by existence of the insulating cover coat 12, and by this diameter expansion, it increases top surface area and presses the electric conduction particle 4 of requirements fit in this top front face.

[0032] The fault dropped out and short-circuited between leads of the electric conduction particle 4 is canceled, and even if it drops out on a cover coat 12, it will not result in the short circuit between ** bumps immediately, but making it fall easily from a cover coat front face etc. can remove by recognizing existence of the above-mentioned insulating cover coat 12.

[0033] Moreover, as shown in drawing 4 , by existence of a cover coat 12, it prevents effectively that this particle 4 adheres between leads and to a bump's 3 side face at the time of press fit of the electric conduction particle 4.

[0034] Next, drawing 5 has illustrated the case where the above-mentioned electric conduction bump 3 is formed with a metal coat electric conduction ball. This metal coat electric conduction ball has the structure which coated the electric conduction metal membrane 10 which changes from said illustrated elasticity metal to the peripheral surface of the insulating balls 9, such as a plastic bowl and a ceramic ball, pastes up this metal coat electric conduction ball on the front face of the electric conduction lead 2 firmly through conductive paste 11, and implants the electric conduction particle 4 in the electric conduction metal membrane 10 of this ball top face by press fit. At this time, the electric conduction particle 4 breaks through the electric conduction metal membrane 10, and carries out partial press fit into the insulating ball 9.

[0035] The above-mentioned metal coat electric conduction ball is easy to **** in uniform magnitude with the diameter of minute with a known technique, and the non-set of the electric conduction bump's 3 height can be corrected.
[0036] it is shown in drawing 1 , drawing 2 , drawing 3 , drawing 4 , and drawing 5 -- as -- each above-mentioned electric conduction particle 4 -- the front face of the flexible insulation film 1 made of synthetic resin, and abbreviation -- it implants by press fit so that it may be set to the parallel protrusion level L.
[0037] The press fit to electric conduction bump 3 top face of the above-mentioned electric conduction particle 4 and a setup of the above-mentioned protrusion level L are performed by the approach of drawing 6 . First, the patchboard which the front face of the flexible insulation film 1 made of synthetic resin was made to carry out plating growth of the lead 2, and formed the necessary circuit pattern in it as mentioned above is prepared. As the electric conduction bump 3 is attached to IC external contact of this lead 2 front face, and the corresponding location next and it is shown in another side drawing 6 A and B The electric conduction particle 4 is sprinkled on a flat surface 7, it piles up so that the electric conduction bump 3 and the electric conduction particle 4 may counter the diffusional aspect of this electric conduction particle 4 in the above-mentioned patchboard, and the whole patchboard is pressurized in parallel. As a result, the electric conduction particle 4 is forced on homogeneity, and comes to be pressed fit in each electric conduction bump's 3 top-face 3b.
[0038] even if variation is in the magnitude of a particle by taking the approach of forcing ****** on a flat surface 7, forcing the electric conduction bump 3 against this, and pressing the electric conduction particle 4 fit like the above, in the level of a flat surface 7, the above-mentioned press fit should do the electric conduction particle 4 -- the front face of the insulating film 1, and abbreviation -- the parallel protrusion level L -- with -- **** -- the structure to implant is acquired.
[0039] The structure which the electric conduction particle 4 was limited and pressed fit in the top face of the electric conduction bump 3 of Yamagata by the above-mentioned pressure process, and was implanted at coincidence is acquired. Moreover, by using the electric conduction bump 3 as an elasticity metal as aforementioned, slipping of the particle in the early stages of press fit is inhibited, it presses fit comparatively easily also to a bump's 3 slope, and the press fit depth can be secured.
[0040] or [moreover, / applying the suitable solvent for an electric conduction bump's front face] -- or after heating and changing a front face into a softening condition, it can push against the above-mentioned spraying particle, and press fit can be promoted.
[0041] As shown in drawing 2 , in order to strengthen the implantation reinforcement of the above-mentioned electric conduction particle 4, it is a wrap to one at the elasticity metal membrane 8 about the front face of the above-mentioned electric conduction bump 3 and the electric conduction particle 4.
[0042] This metal membrane 8 is coated with the combination of plating or a spatter, and both, strengthens film attachment reinforcement, and prevents omission of the electric conduction particle 4 effectively.
[0043] Moreover, the above-mentioned electric conduction bump 3 forms by plating, and also attaches conductive paste to a lead front face by print processes in Yamagata, and makes it combine with a lead front face firmly by heat treatment.
[0044] Conductive paste is what kneaded the metal powder and the synthetic-resin paste, and, generally metal powders are nickel, solder, copper, gold, etc.
[0045] Drawing 7 shows the example which constituted the probe unit used for inspection of a liquid crystal plate based on the technique explained based on drawing 1 thru/or drawing 6 .
[0046] As mentioned above, straight-line-like electric conduction lead 2' is arranged in parallel as a circuit pattern on that front face, using the flexible insulation film 1 made of synthetic resin as a base plate, plating growth is carried out, the electric conduction bump 3 who changes from said elasticity metal to the point front face of this electric conduction lead 2' is attached, it limits to this electric conduction bump's 3 top face, and the electric conduction particle 4 is implanted by press fit.

[0047] this electric conduction bump 3 — the electric conduction particle 4 -- with -- **** — pressurization contact is flexibly carried out to electrodes, such as a liquid crystal plate, and healthy contact is acquired.
[0048] Like IC etc., minute pitch-ization is progressing very much and the electrode of a liquid crystal plate is in a situation with difficult management by the lead pierced from the conventional metal plate. This invention is effectively applicable as a probe unit used for checking of a **** liquid crystal plate.
[0049] An electric conduction lead and an electric conduction bump's formation approach, the quality of the material and the method of implanting an electric conduction particle, its quality of the material, etc. use the publication based on drawing 1 thru/or drawing 3 about the attachment of an insulation cover coat.
[0050] although illustration is not carried out — as other examples of an operation gestalt of this invention -- the above-mentioned electric conduction bump 3 -- the electric conduction particle 4 -- with -- **** -- after making the external contact 6 of electronic parts 5 carry out pressurization contact, synthetic resin (adhesives) can be poured in between external contacts with a bump 3, both 3 and 6 can be combined firmly, and the contact condition by particle press fit can be maintained healthfully.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

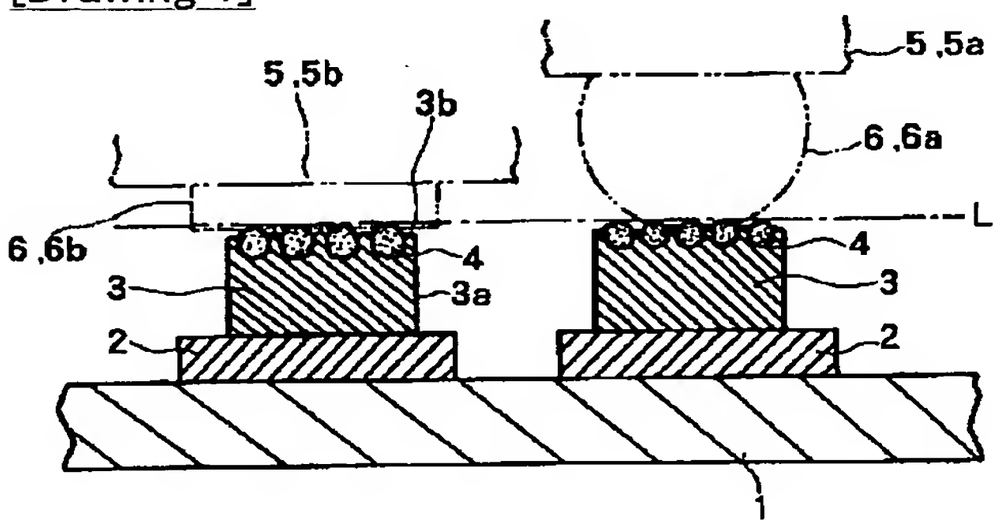
[Brief Description of the Drawings]
[Drawing 1] It is drawing which is an important section expanded sectional view showing the example of the 1st operation gestalt of the flexible patchboard for electronic-parts contact concerning this invention, and explains the condition of having carried out pressurization contact of each electric conduction bump at the external contact slack electric conduction ball of a BGA form IC package, and the external contact slack electric conduction foil of raise in basic wages IC or a lead loess form IC package, respectively.
[Drawing 2] the example of the 2nd operation gestalt of this invention -- the same condition as drawing 1 -- with -- **** -- it is the shown important section expanded sectional view.
[Drawing 3] The sectional view in which A, B, C, and D show the above-mentioned electric conduction bump's formation approach in order of a process, and B' are the top views in the condition of B.
[Drawing 4] the example of the 3rd operation gestalt of this invention -- the same condition as drawing 1 and drawing 2 -- with -- **** -- it is the shown important section expanded sectional view.
[Drawing 5] It is the expanded sectional view of the electric conduction bump who shows the example of the 4th operation gestalt of this invention.
[Drawing 6] A and B are the important section expanded sectional views showing the process which implants an electric conduction particle in an electric conduction bump by press fit.
[Drawing 7] It is the perspective view of a probe unit showing the example of the 5th operation gestalt of this invention.
[Description of Notations]
1 Flexible Insulation Film made of Synthetic Resin
2 2' Electric conduction lead
3 Electric Conduction Bump
3a This bump's perimeter side face
3b This bump's top front face
4 Electric Conduction Particle
5 Electronic Parts
5a IC body
5b Raise in basic wages IC body
6 External Contact
6a Electric conduction ball
6b Electric conduction foil
7 Flat Surface
8 Metal Membrane
9 Insulating Ball
10 Electric Conduction Metal Membrane
12 Insulating Cover Coat
13 Stoma
14 Minor Diameter Base

15 Major-Diameter Crowning
16 Sensitization Resist Layer
17 Stoma
L Protrusion level

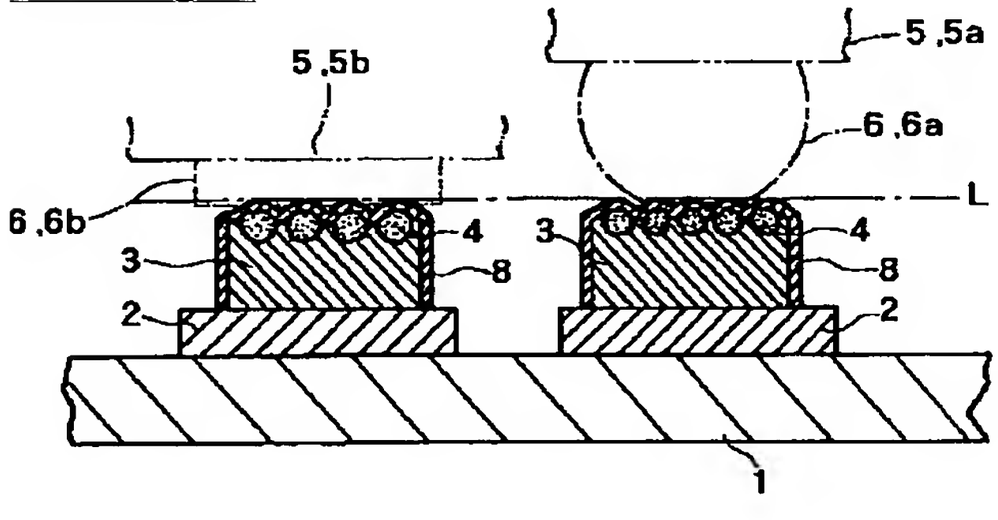
[Translation done.]

DRAWINGS

[Drawing 1]



[Drawing 2]



[Drawing 3]

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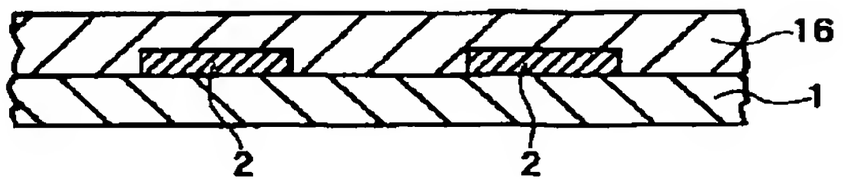

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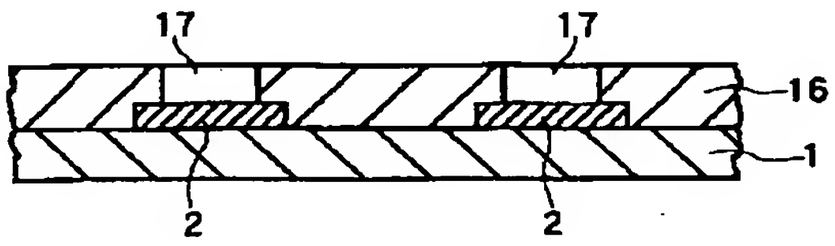

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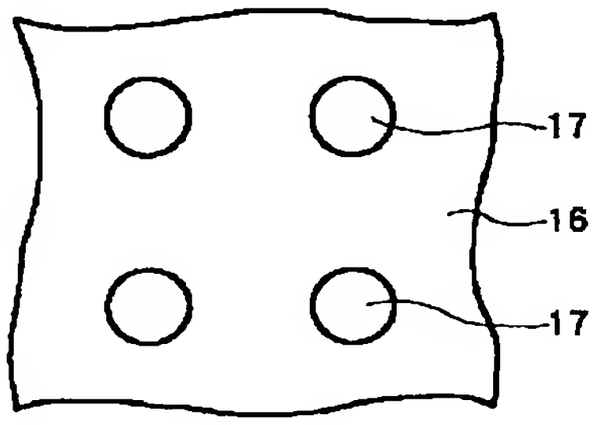

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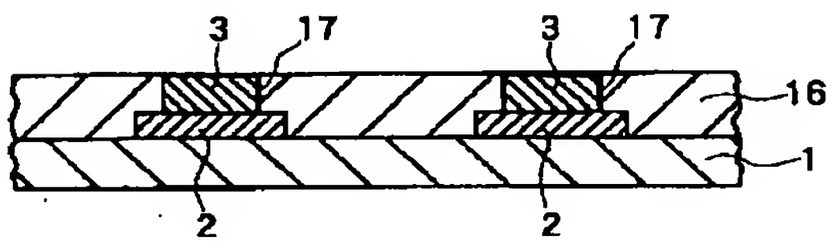

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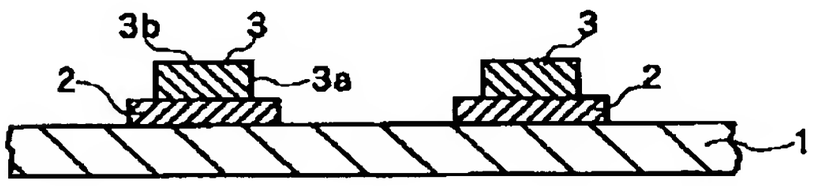
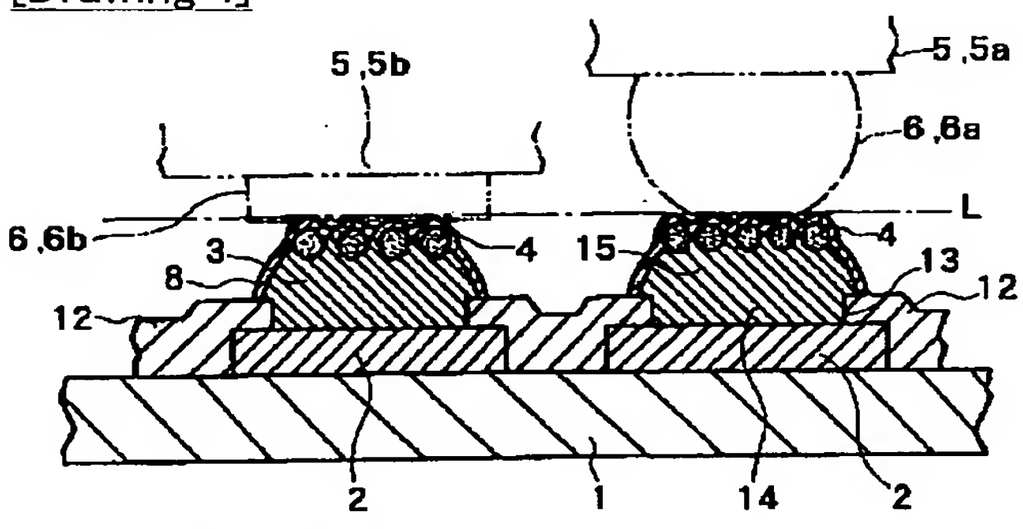
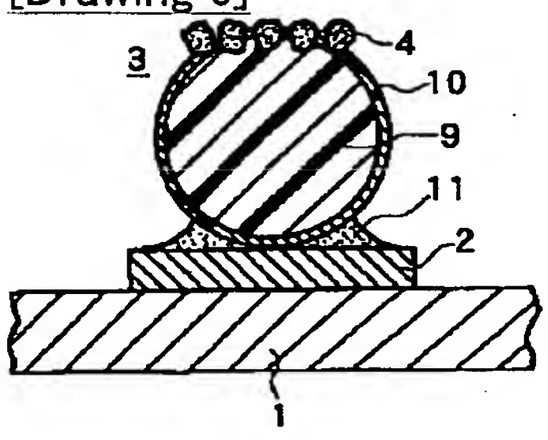


[Drawing 4]



[Drawing 5]



[Drawing 6]

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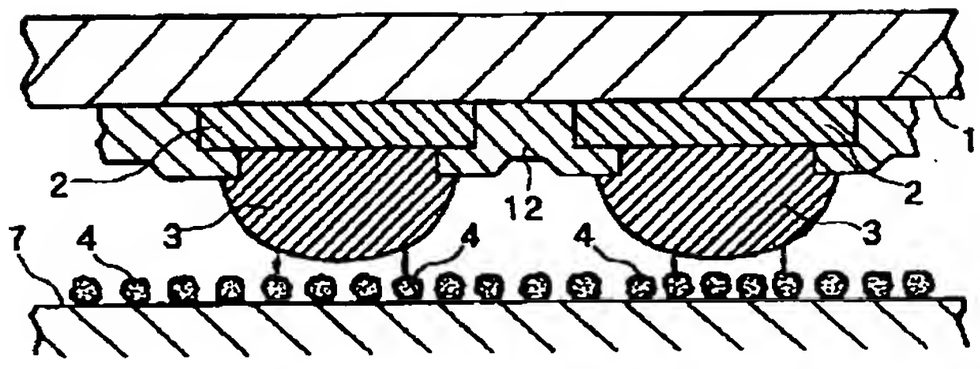

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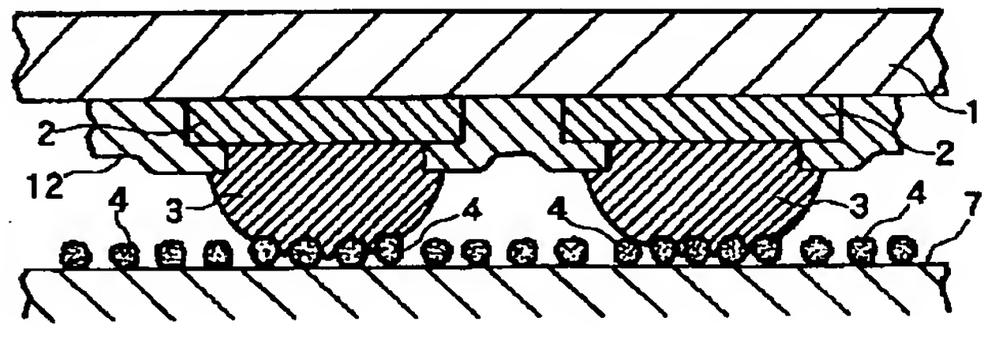
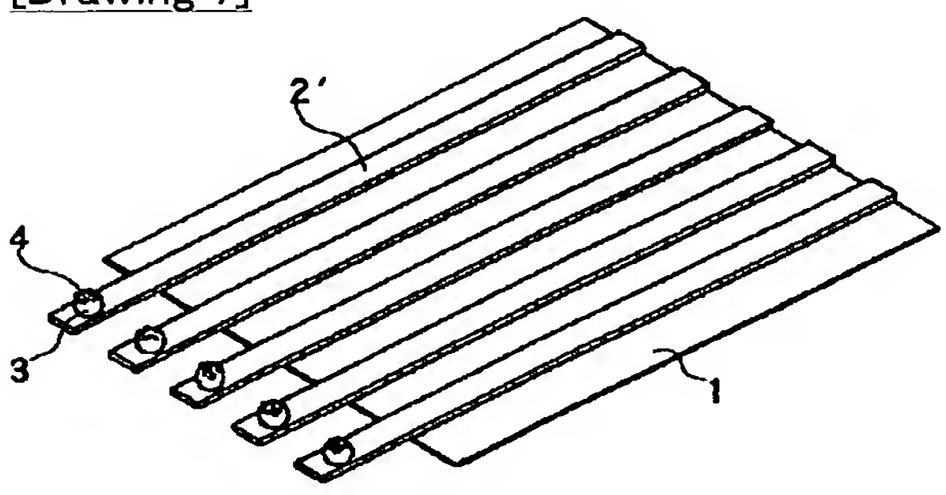


[Drawing 7]



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* NOTICES *

WRITTEN AMENDMENT

[Procedure revision]
[Filing Date] December 12, Heisei 8
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] 0021
[Method of Amendment] Modification
[Proposed Amendment]
[0021] The above-mentioned electric conduction bump 3 forms by the approach shown in drawing 3 as an example. As first shown in drawing 3 A, the wrap sensitization resist layer 16 is formed for the flexible insulation film 1 made of synthetic resin, and lead 2. Put the mask which has a circular stoma corresponding to arrangement of an electric conduction bump on this sensitization resist layer 16, and the sensitization resist layer in this stoma is exposed. As this exposure section is removed and it is shown in drawing 3 B and E, the stoma 17 of the plane view round shape which carries out opening to the sensitization resist layer 16 in a lead front face is formed. Next, as are shown in drawing 3 C, and plating growth is carried out and the electric conduction bump 3 is shown in a lead front face in this stoma 17 at drawing 3 D, the resist layer 16 is removed. This electric conduction bump 3 has perpendicular side-face 3a, and it is a plane view round shape, and top-face 3b is an approximate plane.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] Easy explanation of a drawing
[Method of Amendment] Modification
[Proposed Amendment]
[Brief Description of the Drawings]
[Drawing 1] It is drawing which is an important section expanded sectional view showing the example of the 1st operation gestalt of the flexible patchboard for electronic-parts contact concerning this invention, and explains the condition of having carried out pressurization contact of each electric conduction bump at the external contact slack electric conduction ball of a BGA form IC package, and the external contact slack electric conduction foil of raise in basic wages IC or a lead loess form IC package, respectively.
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which implants an electric conduction particle in an electric conduction bump by press fit.
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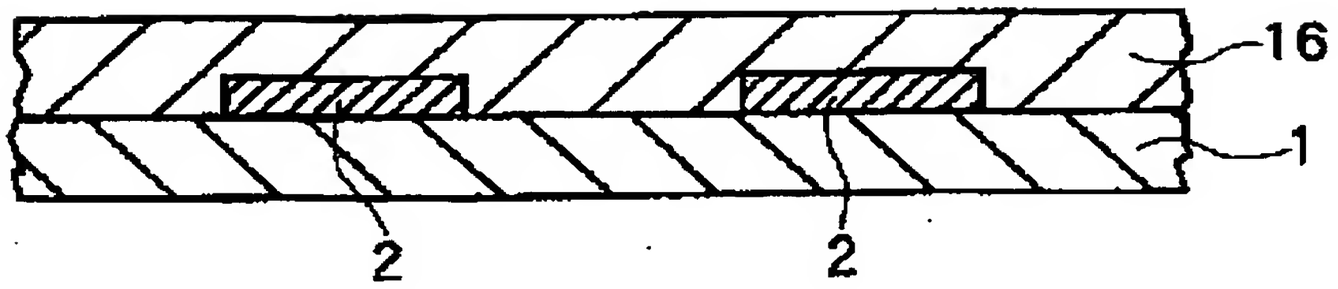
9 Insulating Ball
10 Electric Conduction Metal Membrane
12 Insulating Cover Coat
13 Stoma
14 Minor Diameter Base
15 Major-Diameter Crowning
16 Sensitization Resist Layer
17 Stoma
L Protrusion level
[Procedure amendment 3]
[Document to be Amended] DRAWINGS
[Item(s) to be Amended] drawing 3
[Method of Amendment] Modification
[Proposed Amendment]
[Drawing 3]

(A)



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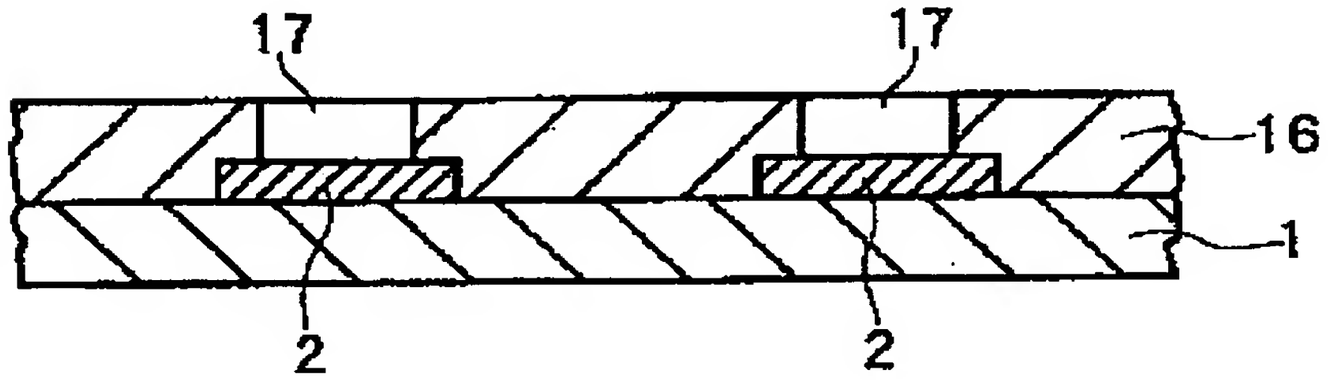

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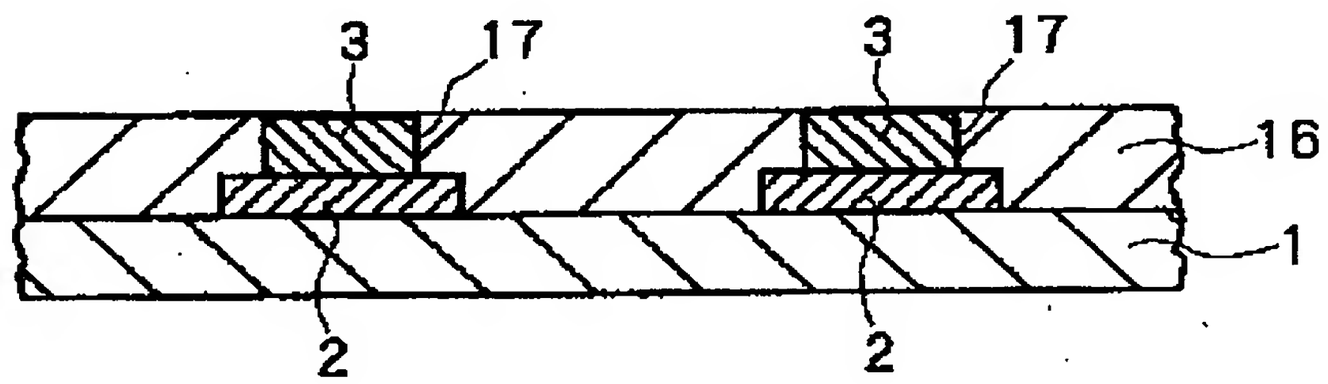

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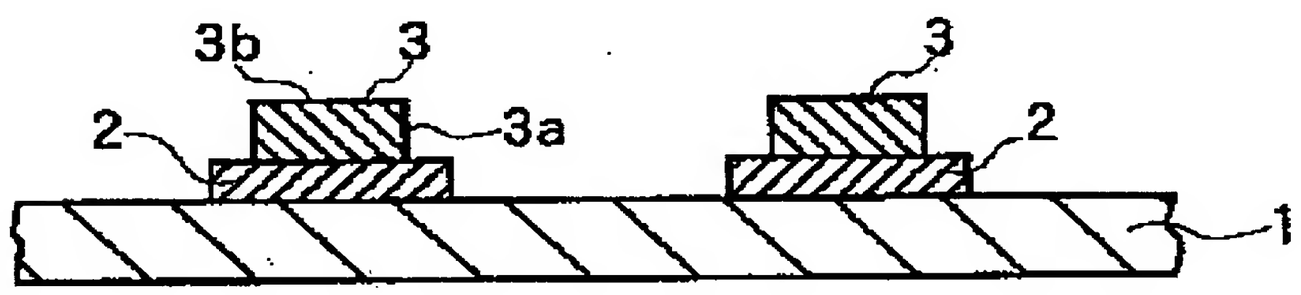

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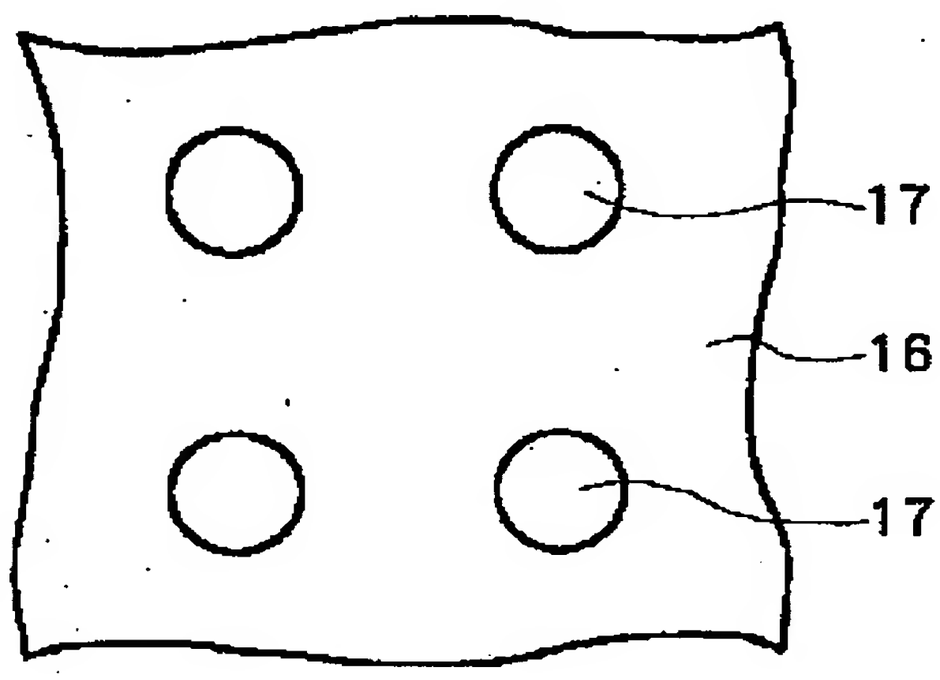

[Translation done.]